FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

Dec. 15	Lecture, "Development of the Fighting Aeroplane," by Capt. F. M. Green, before R.Ae.S.
1922.	
Jan. 5	Lecture, "Specialised Aircraft," by Wing-Com. W. D. Beatty, before R.Ae.S.
Jan. 19	Lecture, "Aeroplane Installation," by Brig.-Gen. R. K. Bagnall-Wild, before R.Ae.S.
Feb. 2	Lecture, "Radiological Research," by Dr. V. E. Pullin, before R.Ae.S.
Feb. 7 & 8	Second Air Conference at Guildhall
Feb. 16	Lecture, "Methods of Instruction in Aeroplane Flying," by Sq.-Leader Portal, before R.Ae.S.
Mar. 2.	Lecture, "Testing Aircraft to Destruction," by W. D. Douglas, before R.Ae.S.
Mar. 26–April 2	Nice Meeting
Mar. 30	Lecture, "The Design of a Commercial Aeroplane," by Capt. de Havilland, before R.Ae.S.
July 6–20	French Gliding Competition

EDITORIAL COMMENT



IN the Australian House of Representatives last week Mr. Hughes moved the following resolution, which was carried unanimously:—

This house, recognising the vital importance to the British Empire of airship communication, views with concern the proposal to abandon the proposed Imperial Air Service scheme, and expresses the earnest hope that the period during which the airships and other existing material will be available will be extended, and that Parliament will be given an opportunity of discussing the proposal to co-operate with Great Britain and the Dominions in a scheme for the establishment of an experimental service.

The Imperial Airship Service

It would seem that pressure of business in the Commonwealth Parliament has prevented the Government from dealing with the matter until the end of the session, and all that it has found possible to do is to secure the expression of opinion we have quoted above. It is a thousand pities that this should be so, for it has given time to the wreckers at home to effect their purpose of scrapping the airships and all their paraphernalia. No doubt the spokesmen of the Government will say that they have not as yet been scrapped, but are still awaiting word of what is to be done in conjunction with the Dominions, if anything. The facts are, however, that the scrapping process is in full swing, and that the airships and airship stores are being prepared for handing over to the Disposal Board at a very early date. We believe it is now very largely a question of book-keeping—that all that remains is to agree with the Auditor-General exactly what stores and so forth are to be handed over. The main decision has been quietly taken, and the airships are as surely doomed as though they had been already broken up.

The main result is that all the experience gained during the War, at a cost to the British taxpayer of a round £40,000,000, is to be thrown to the winds. That it is being done in the sacred name of economy is beside the point. Poor as the nation is, it is not so poor that it cannot afford the half-million or so it would have cost to put beyond all doubt the question of whether the airship is a commercial proposition or not. That was all that was asked for. The Dominions were willing to find their quota, and they believe in the possibilities profoundly. So does everybody in this country who has given the matter

intelligent thought, save and except those unfortunately in authority who desire to spend every penny of the Air Estimates on increasing the military wing of the Air Service. We shall have to institute airship services between the Mother Country and the Dominions before we are much older, and as a result of the present short-sighted policy of the Government, we shall have to commence at the beginning again, and it will cost the country far more than is being saved by misguided "economy" now.

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The Air and the Irish Settlement

In the text of the agreement arrived at between the Cabinet and the Irish representatives, the future of aerial relations between the British Government and the new Irish Free State is, as we briefly mentioned last week, provided for. In the matter of Imperial defence, it is stipulated that facilities shall be provided at the four naval stations of Berehaven, Queenstown, Belfast Lough, and Lough Swilly. In the matter of civil air communications by air, it is agreed that a convention shall be made between the two Governments for its regulation. We take it this latter means that the new Government of the Irish Free State will become a signatory to the International Air Convention, possibly with the addition of such provisions for internal control as may be agreed between the two Governments.

Apart from any question of satisfaction that a political problem of the first magnitude has been settled by the Agreement, we are very pleased to know that air matters have come within the purview of the settlement. We have long been of the opinion that one of the routes on which an air service would justify its existence is between England and Ireland. We believe such a service would rapidly become popular, and might easily before long even rival the London-Paris service in numbers of passengers and bulk of goods carried. To be able to avoid the comparatively lengthy sea passage between the two countries would certainly be an attraction to the traveller, while the time saved *en route* would obviously be greater than is saved by the London-Paris air service. As soon, therefore, as the necessary convention has been signed, we shall look forward to seeing the almost immediate institution of a service across the St. George's Channel.

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Mr. Wells and War in the Air

Mr. H. G. Wells, in one of his recent cables to the *Daily Express*, makes our flesh creep by his prophecies of what will happen in the next great war. War as we saw it in the period between 1914–18 is already old-fashioned, he tells us. The old idea of an army marching on an enemy's capital has given place to a new conception of an attack through propaganda, through operations designed to produce acute economic distress, and through the air on enemy populations. The closing years of the War, he says truly, gave the world only a slight experience of what aerial offensives can be. Always the air operations were subsidiary to the surface engagements of the belligerents. He then draws a picture of Japanese aircraft devastating San Francisco, while American aeroplanes are bombing Tokyo with the very latest thing in poison gas and high-explosive bombs.

We need not follow Mr. Wells through the whole of his speculations on what will happen when in the future two great powers become involved in war. When in 1908 he wrote his "War in the Air" the aeroplane had not really arrived, and it was permissible for the man in the street to regard it as a phantasy of the novelist's imagination. Today everybody knows it is absolutely as certain as that night follows day that within a very few hours of a declaration of war between this country and any first-class European power the enemy's aircraft would be dropping bombs on London. We should be subjected to a mass air attack beside which the worst experience of the late War would fall into nothingness. The German attacks on London were very properly described as "raids." They were nothing else. They were annoying, and they certainly caused some amount of material damage, but the latter was quite insignificant in comparison with what would happen in the event of another war with a power prepared for aerial action on a great scale.

Now, although the Washington Conference is doing its best to ensure that there shall be no more war, we have no assurance in the world that its efforts will be permanently successful. By permanently we do not mean success for all time, but over a reasonable period of years. We do not know that they will succeed in keeping the peace for, let us say, the next twenty years. It is utterly impossible for the most far-seeing of statesmen to say what may happen even in the next five years, or certainly in ten. The resultant situation is a somewhat peculiar one. Sea and land armaments are to be limited—or at least it is hoped and believed they will be. There are not wanting many of sound judgment who think that this is a matter of very little consequence except in so far as the saving of the money at present spent on navies and armies is concerned. They say, and with considerable show of reason, that these forces are already out of date, since the issues of war will in future lie in the air, and ships and armies are therefore a superfluity. Aircraft, for good and obvious reasons, are not, by the terms arrived at by the Conference, to be limited, and any power can therefore amass enormous power in the air by the simple process of spending its money, aforetime devoted to old-fashioned armaments, in the direct encouragement of civil air communications. By so doing it will build up a great reserve of trained air pilots, with staff and organisation, and will become possessed of great numbers of machines almost instantly available for conversion to warlike use. France is doing this. Germany is laying plans to the same end as soon as the fetters of the Peace Treaty are removed. What are we doing? Unfortunately, the answer is all too obvious. Next to nothing at all. It is time the nation was awakened to the full consequences of our want of an aerial policy.

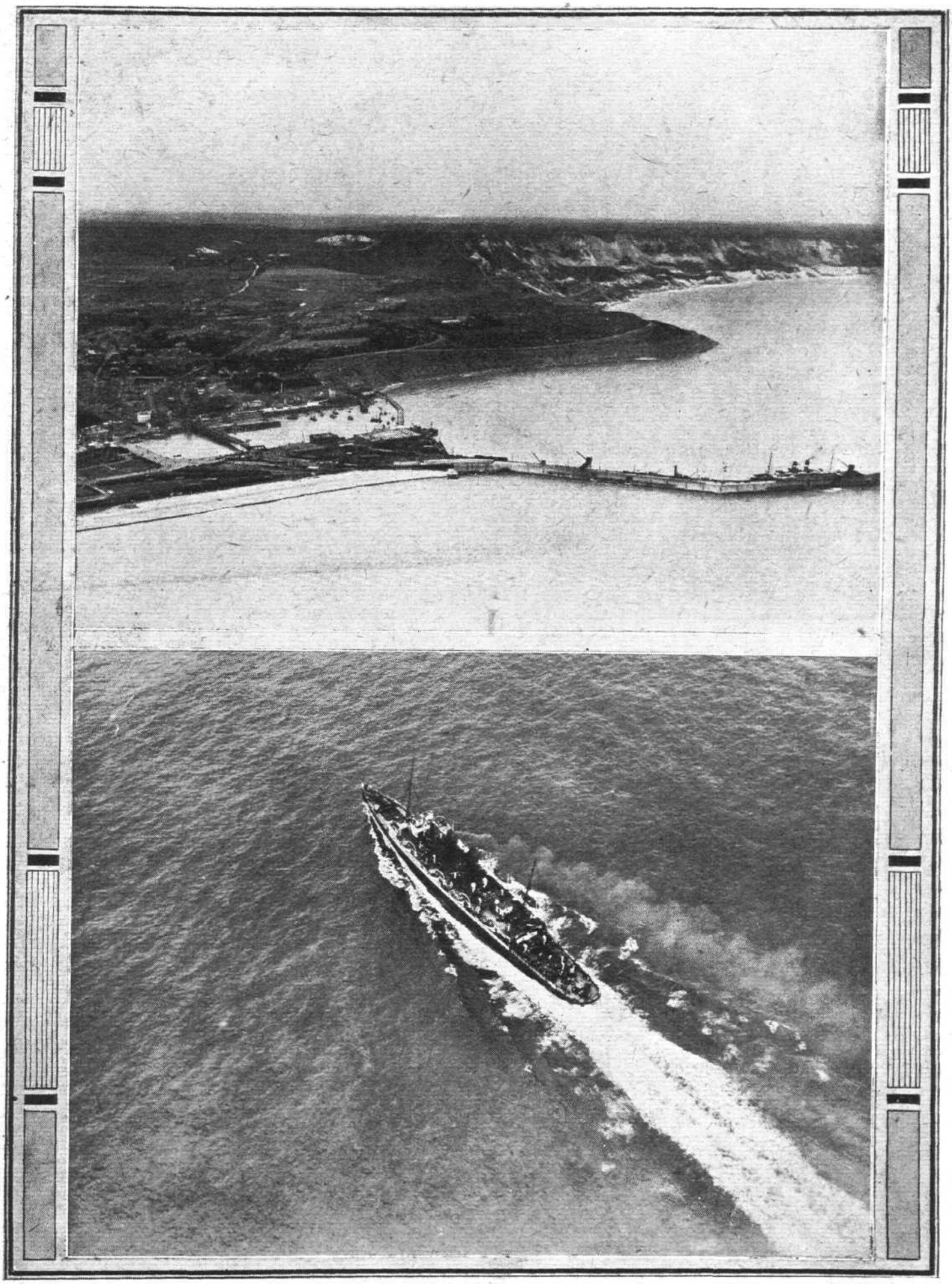
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Flying Contests in 1922

THE Minister of War has approved the proposal of the High Command for Aeronautics to hold two flying contests during September, 1922, the Tyrrhenian Cup and the Italian Grand Prix.

There will also be a parachute competition with prizes of 500,000 lire and a balloon contest with prizes of 30,000 lire. All the above events are international.

In order to encourage those aircraft constructors whose machines do well in the contests, the Ministry of War has set aside 400,000 lire for the acquisition of these machines, which will then be handed to the civil aviation companies by way of subsidy, for the operation of civil air services,



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LONDON-PARIS FROM THE AIR, AS SEEN FROM A HANDLEY PAGE MACHINE:

No. 18.—*At top*, Folkestone and the White Cliffs of England; *below*, Passing over the Channel Steamer.



THE · PARIS · AERO · SHOW · 1921

BY THE TECHNICAL EDITOR

(*Continued from page* 814.)

LIGNES AÉRIENNES LATÉCOÈRE,
182, Boulevard Haussmann, Paris (8e)

ALTHOUGH not a newcomer to the aircraft industry—having exhibited a machine at the Paris Aero Show of 1919—the name Latécoère is probably associated, in the minds of most readers of FLIGHT, with the operational rather than with the constructional side of commercial aviation. For more than two years, the *Lignes Aériennes Latécoère*, or, to give the firm its modern name, *Compagnie Générale d'Enterprises Aéronautiques*, have been operating the Tolouse-Barcelona-Alicante-Malaga-Morocco air service. The firm was reconstructed some months ago, and we understand that construction is to be undertaken on a much larger scale than before. The Latécoère works of Toulouse are really coach and carriage manufacturers, and aviation is one of their side issues. Incidentally, the Latécoère firm is one of the few who combine air transport with aeroplane construction. At the Paris show of 1919 a small postal aeroplane was exhibited, which was little more than a two-seater fighter, minus guns and other gear, and with a corresponding increase in useful load. At the present exhibition, two complete machines are shown, and an all-metal *fuselage* of very unusual construction.

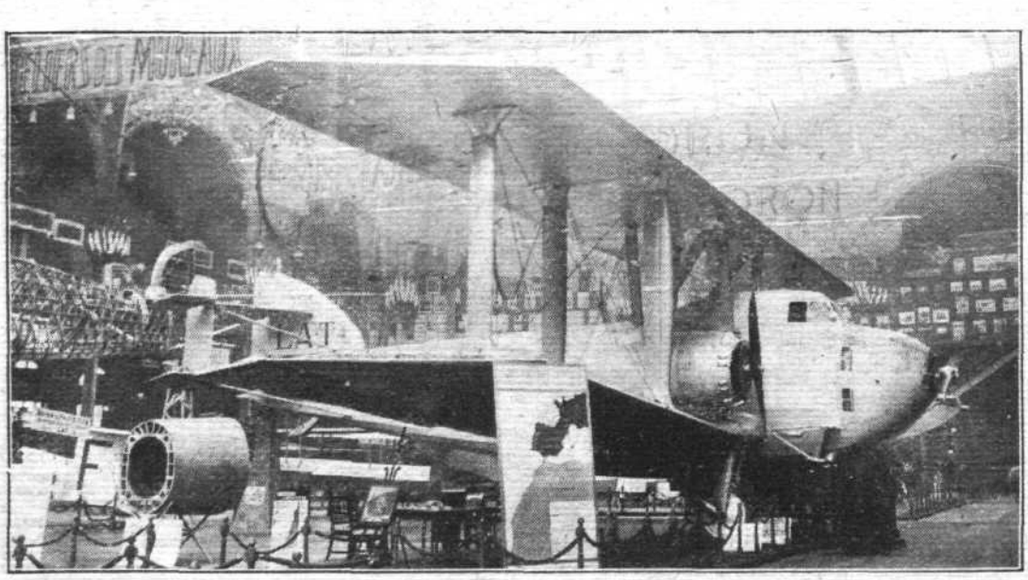
The Latécoère type "Lat. 8" is a single-engined machine, with 300 h.p. Renault. It has a small cabin with accommodation for five passengers. The pilot is placed aft of the cabin, and, as far as it was possible to ascertain, there are no means for communication between him and the passengers. The only feature of this machine which is worth placing on record is that there is a celluloid panel in the roof by way of providing an emergency exit, a feature, by the way, which French constructors generally do not appear to deem necessary, as a great many of the machines shown did not possess even this elementary precautionary measure. The *ailerons* of the Latécoère 8, as also of the large three-engined machine, are of the same unusual type as those of the 1919 machine, *i.e.*, the *aileron* horn balance works in a cut-out portion of the wing, and the trailing edge of the latter is thinned down just in front of the leading edge of the horn balance. The resulting section at this point is not unlike a Howard Wright, but with the rear portion movable. As the feature has been retained, it may be presumed to have proved effective.

Following are the main characteristics of the "Lat. 8": Engine, 300 h.p. Renault. Span, 43 ft. 4 ins.; wing area, 530 sq. ft.; wing loading, 9 lbs./sq. ft.; power loading, 15·4 lbs./h.p.; speed near ground, 112 m.p.h.; at 6,600 ft. 105 m.p.h.

The type "Lat. 4" is a very large three-engined machine, with three 300 h.p. Salmson engines, placed one in the nose of the *fuselage*, and the other two on the wings, or rather between the wings, as they are supported mainly from the *fuselage*. The machine is far from being pretty, and its bulk appears unnecessary compared with the number of passengers carried.

The *fuselage* is of ample dimensions, and the large cabin is divided by a partition into two more or less separate cabins. A count of the seats discloses only 16, although the passenger accommodation claimed is 20. Possibly the remaining passengers are tucked away in the pilot's cockpit, and in the anteroom, near the entrance door. The pilot's cockpit is immediately aft of the *fuselage* engine, and has a raised roof, somewhat like a conning tower. An opening in its roof allows the navigator to get his head outside to survey the situation.

The front engine is neatly covered in by the *fuselage* covering, and the two wing engines are enclosed in streamline power eggs, presumably with their tanks mounted just behind them. The method of supporting the engines is unusual,

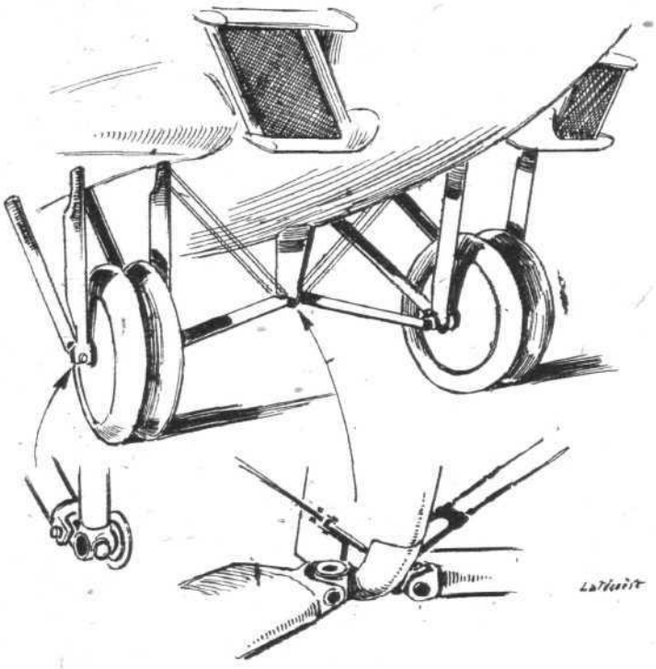


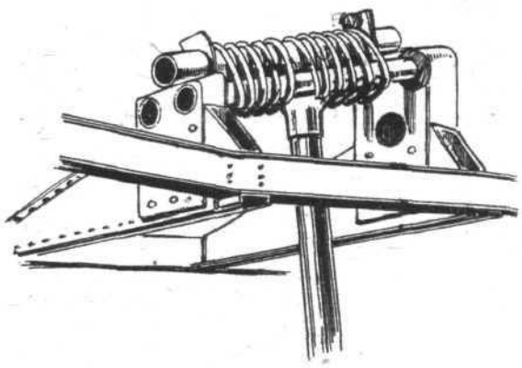
The three-engined Latécoère is a very large machine for the number of passengers carried.

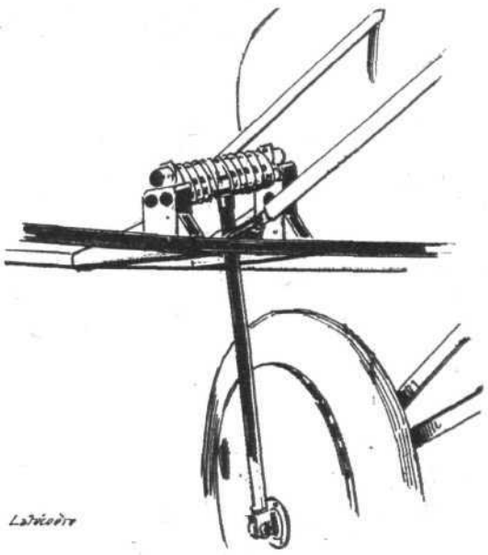
"Flight" Copyright

inasmuch as the main supports are in the form of struts springing from the *fuselage*. There is a strut running to the lower wing spars, where the crutch type of shock absorbing arrangement is installed, and the engine support structure is triangulated. If sufficiently strongly carried out, this method of supporting the engines should have the advantage of lessening the amount of vibration transmitted directly to the lower wing spars, the main attachments being on the *fuselage* where it is easier to take care of the heavy concentrated loads. Also the engines are easily accessible.

The main plane structure is chiefly remarkable on account of the absence of struts in way of engine cars, there being only three struts on each side. Some distance outside the engines is a pair of inter-plane struts with incidence bracing of the usual form, while further out towards the tip is a single I-strut. The *ailerons* are of the same type as those of the smaller machine already referred to.







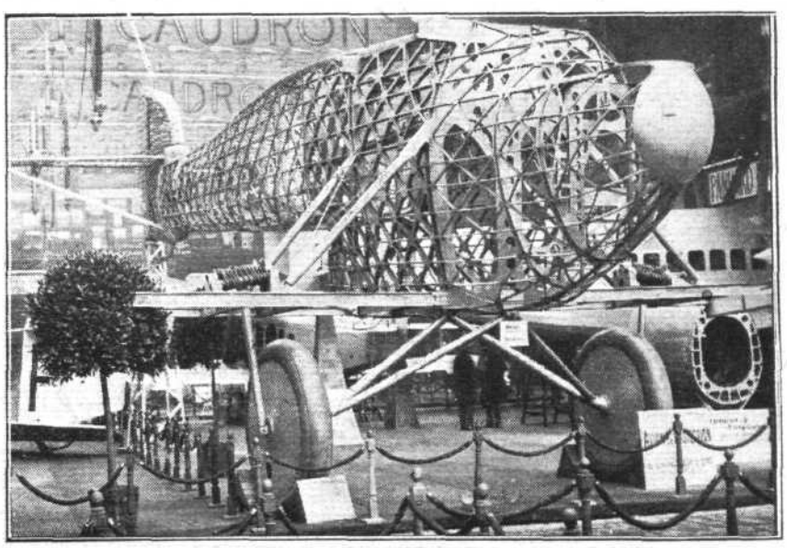
SOME LATÉCOÈRE DETAILS: Above the four-wheeled undercarriage of the three-engined machine. The shock absorbers are inside the wings. On the right are shown the details of the crutch arrangement of the shock absorbers inside the wing root of the all-metal *fuselage*.

One of the accompaying sketches shows the undercarriage of the Latécoère type 4. The wheels, it will be seen, are in duplicate, and are placed side by side. Owing to the fact that the shock absorbers are housed inside the lower plane, the attachment of the legs of the undercarriage Vees to the axle is by universal joints, and a short strut projecting from the *fuselage* serves as an anchorage.

A biplane tail is fitted on the "Lat. 4." The tail planes are of the trimming type, and there are three rudders, of which the outer two appear to be so arranged as to allow of setting

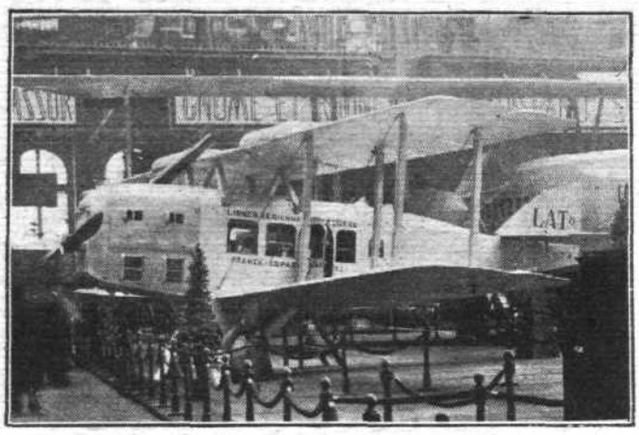


View inside the cabin of the Latécoère three-engined machine.



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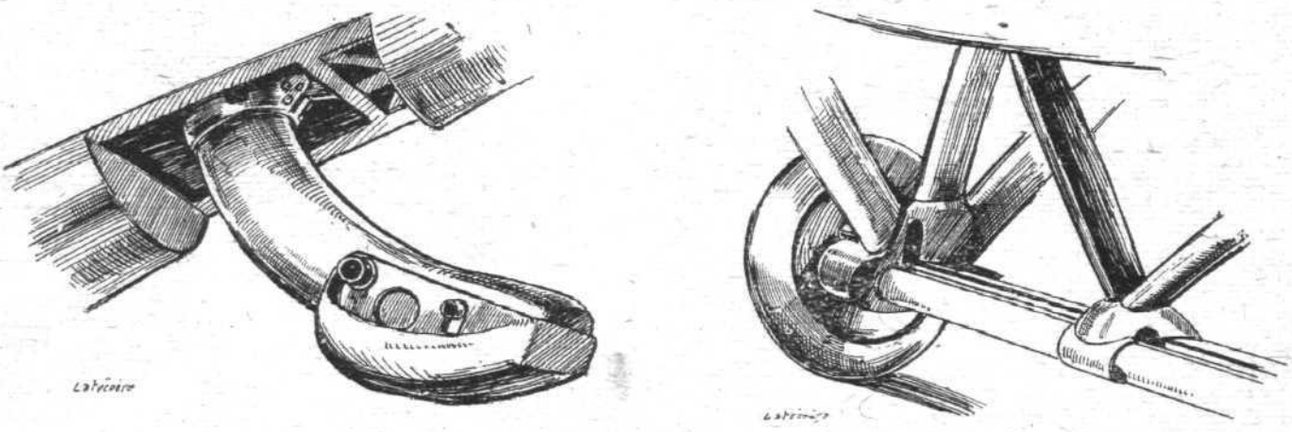
The all-metal *fuselage* of the Latécoère day-bomber.



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The Latécoère 8.

A number of these run longitudinally, with others intersecting them diagonally, the latter wrapping spirally around the *fuselage*. Vertical formers or bulkheads serve as supports for the diagonal and longitudinal stringers. The remarkable feature about the construction is that all diagonal and longitudinal stringers are in short straight pieces, attached to the formers *via* small Duralumin plates at the points of intersection. As there appears to be one rivet only securing the ends of the stringers to these plates, the structure appears to be none too strong, but one understands that it is intended to cover the whole *fuselage* with thin sheet metal. By the time this is riveted to the basketwork with a few hundred thousand rivets, there will probably be sufficient strength in the structure. But what an enormously expensive *fuselage* it must have been. And any gains which one might hope for by this form of construction must have been outweighed many times by the time and cost involved. Frankly, we do not think the design a good one, and as regards the workmanship the less said the better. A great percentage of the rivets appear to have been placed dangerously close to the edges of the metal, which here and there has split from the rivet holes to the edge.



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TWO LATÉCOÈRE DETAILS: On the left the very substantial tail skid, and on the right one side of an undercarriage.

a course, while normally the centre one only is used for steering. The bracing of the tail is unusual, and one noticed that the lift wires run out at a very flat angle indeed. No data of weights or performance of this machine are available, but the main dimensions are as follows: Length, over all, 47 ft. 9 ins.; span, 81 ft.; height, 20 ft. 6 ins.

A huge *fuselage* was also exhibited on the Latécoère stand. This is for a bomber, and is one of the most remarkable pieces of metal construction in the whole of the exhibition. The metal employed is Duralumin throughout, and nearly everywhere it is employed in the form of channel sections.

The "Lat. 6" is intended, as already said, for a bomber, and is in addition to be provided with a very full complement of guns, according to a sketch elevation given in a catalogue. According to the brief specification, there are to be four engines of 250 h.p., placed in pairs on the wings. The general characteristics are to be as follows: Length o.a., 51 ft. 8 ins.; span, 84 ft.; height, 20 ft. 6 ins.; wing area, 1,300 sq. ft.; total loaded weight, 11,600 lbs.; wing loading, 8·9 lbs./sq. ft.; power loading, 11·6 lbs./h.p.; speed near the ground, 142 m.p.h.; speed at 13,000 ft., 133 m.p.h.

(To be Continued.)

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN DECEMBER 4 AND DECEMBER 10, INCLUSIVE

Route‡	No. of flights*	No. of passengers	No. of flights carrying Mails	No. of flights carrying Goods	No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
						h. m.		
Croydon-Paris	14	27	7	10	9	2 29	D.H. 4 G-EAWH (2h. 3m.) ...	D.H. 4 (1), D.H. 9 (1), D.H. 18 (2) G. (3), H.P. (2), Sp. (2), V. (1).
Paris-Croydon	12	9	2	7	11	2 58	D.H. 4 G-EAWH (2h. 20m.)	D.H. 4 (1), D.H. 18 (2), G. (2), H.P. (2), Sp. (1), V. (1).
Totals for week ...	26	36	9	17	20			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.

‡ Including certain diverted journeys.

§ A journey between Croydon–Rotterdam (goods), and between Amsterdam–Croydon (1 pass.) were also made.

Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4 = De Havilland 4, D.H.9 (etc.).
F = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. N. = Nieuport.
P. = Potez. R. = Rumpler. Sa. = Saimson. Se. = S.E. 5. Sp. = Spad. V. = Vickers Vimy. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc.:—Co. des Grandes Expresses Aériennes; Handley Page Transport, Ltd.; Instone Air Line; Koninklijkie Luchtvaart Maatschappij; Messageries Aériennes; Syndicat National pour l'Étude des Transports Aériens; Co. Transaérienne.

FLIGHT

STATIC RADIAL AIR-COOLED ENGINES

By ROY FEDDEN

A VERY interesting paper under above title was presented by Mr. Roy Fedden, the designer of the famous Bristol "Jupiter" aero engine, before the International Air Congress held in Paris concurrently with the Aero Show. The paper, unfortunately, is too long to make it possible for us to reproduce it in full, much as we should have liked to do so, but the following *résumé* and extracts will, it is hoped, deal with the main points raised by Mr. Fedden.

In his introductory remarks Mr. Fedden dealt with the previous history of radial air-cooled engines, mentioning as examples of pre-War types the Anzanis and R.E.P. fan engines. Although used in considerable numbers, these engines, he pointed out, had somewhat low mean effective pressures and efficiencies, and weighed some four or five lbs. per horse-power. For a time the radial was supplanted by the light air-cooled rotaries, but when the practical limit of that type had been reached, a demand arose for an engine with the same characteristics of manœuvrability, compactness and light weight as the rotary, but of higher power and with better efficiency. The most promising type to fill these requirements was a 300-400 h.p. static air-cooled radial. Mr. Fedden then referred to several types which were developed during 1917 and 1918, but pointed out that these engines did not come up to the best water-cooled, either in reliability or efficiency. Thus at the end of the War the position of the large static air-cooled radial was somewhat ambiguous. Its great possibilities were realised, and there was a definite sphere of usefulness for it, if only the type could be really proved out.

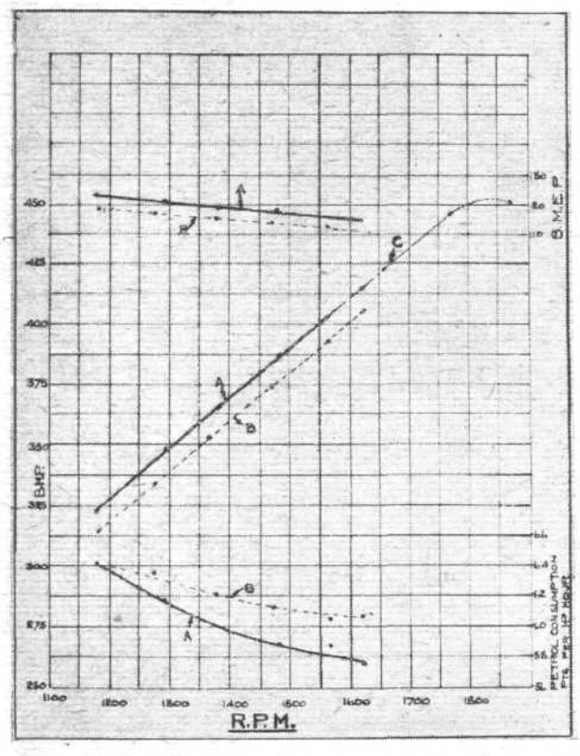


Fig. 1.—Type-test power curves of "Jupiter" engine.

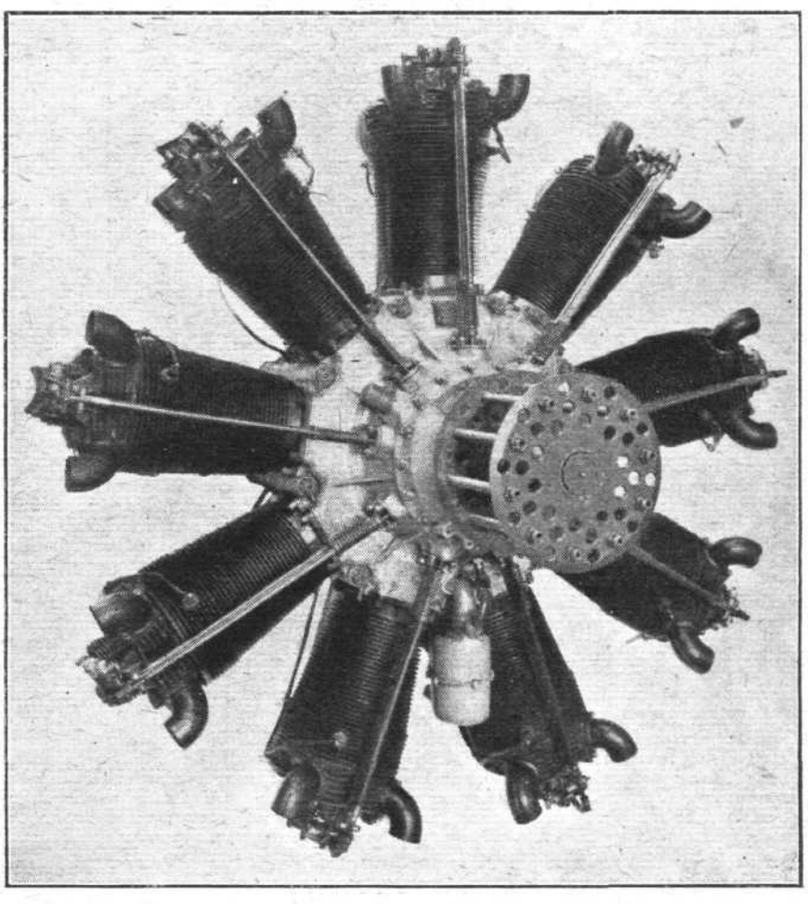
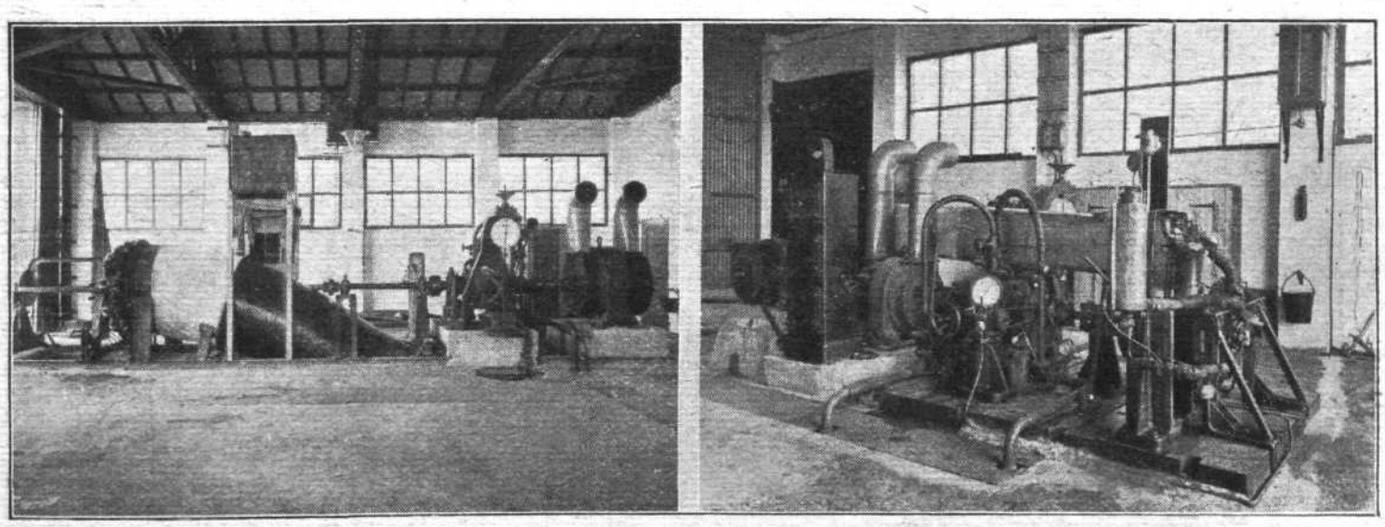


Fig. 4.—Three-quarter front view of Bristol "Jupiter" engine.

The Advantages of the Air-Cooled Radial

Mr. Fedden pointed out that a light engine is at least as important for commercial work as it is for the military machine. For powers ranging from 300 to 600 h.p., and



Figs. 2 and 3.—Main engine test bed, and single cylinder test bed for "Jupiter" engine.

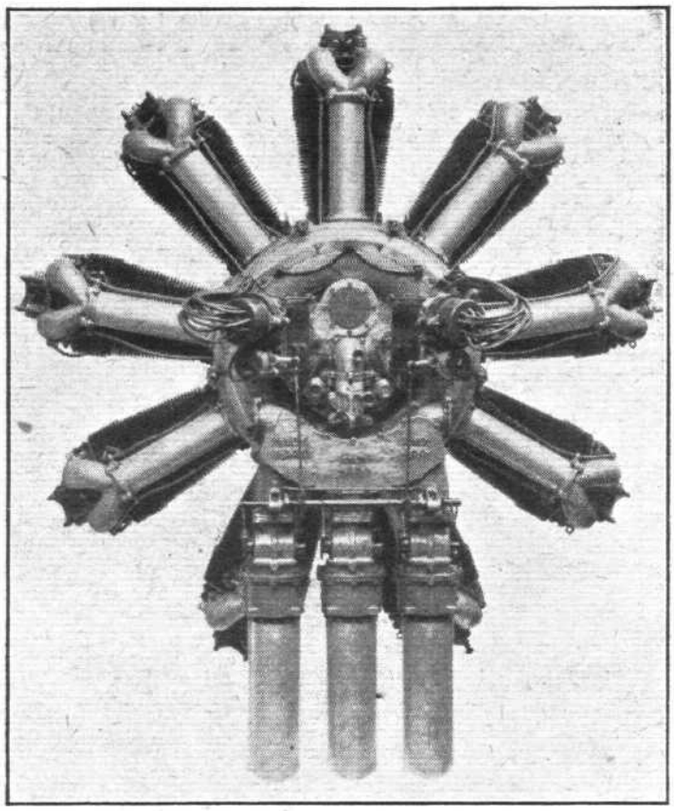


Fig. 5.—Rear view of Bristol "Jupiter" engine.

weighing 2 lbs. per horse-power complete, the lecturer was of the opinion that the static air-cooled radial is the most promising type. In the radial engine, he said, each set of cylinders being disposed round their own crank, there is a consequent economy of both material and space, affording remarkable opportunities for saving weight. Among the advantages of the radial, Mr. Fedden enumerated the following :—

(*a*) In multi-cylinder, single-row radials, owing to the connecting rods all coming on to one common crank, the inertia torque is practically eliminated.

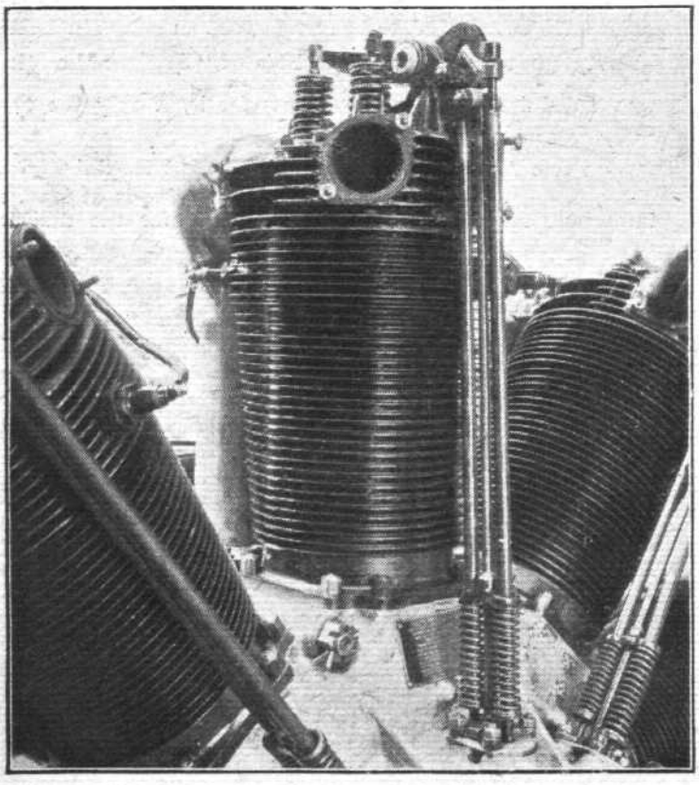


Fig. 6.—Cylinder and rocker mechanism of "Jupiter" engine.

(*b*) It may be geared without coming up against the main inherent problems of gearing, and the problem of attaching a body such as an airscrew, which has a large flywheel effect, is very much simplified.

(*c*) It dispenses with the radiator, piping and water, with its attendant troubles, apart from the corresponding saving in weight.

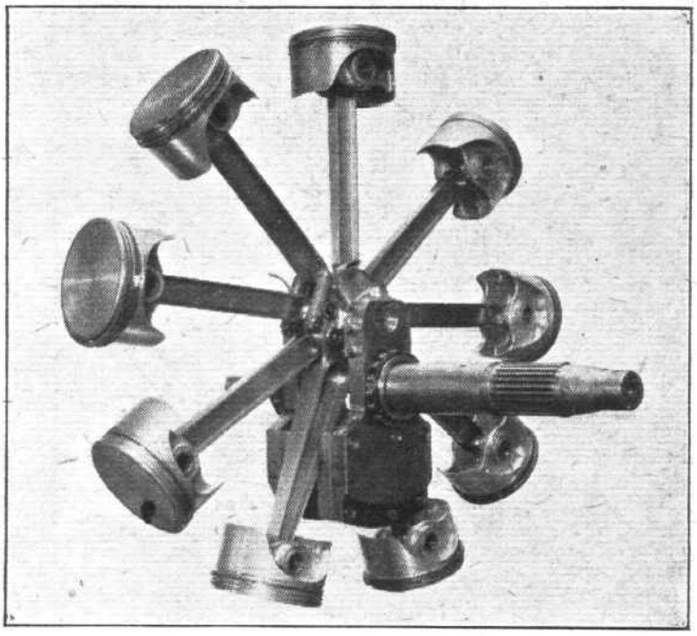


Fig. 7.—Crank shaft, connecting rod, and piston assembly of "Jupiter" engine.

(*d*) In very hot climates air-cooled engines have been found to give better service, because an air-cooled cylinder will maintain full power if the mean temperature of the fins does not exceed 175° C. On the other hand, if the mean temperature of the cooling surfaces of a radiator exceeds 80° C. evaporation losses become considerable. Hence in hot climates, where the air temperature may vary from 0° C. to 45° C., the temperature difference available for cooling may diminish 56 per cent. in the case of the radiator, whilst the diminution is only 25 per cent. in the case of the air-cooled cylinder. When these same conditions are repeated with great change of altitude, the air-cooled engine is even still more at an advantage.

(*e*) The static air-cooled radial can be made the shortest and most compact power unit it is possible to develop for an internal combustion engine working on the four-stroke cycle.

(*f*) From a manufacturing point of view, the radial has great advantages. Nearly all the parts are symmetrical or round, and a considerable proportion of the machining is in the form of large multiples, while there are fewer numbers of parts than in the "straight line" or "V" type of engine of equal power. Mr. Fedden mentioned that the actual number of different parts in a 380 h.p. radial of his design is 370, which is, he says, 25 per cent. less than any other known proved engine of equal power.

(*g*) The air-cooled radial can be dismantled, overhauled and reassembled more quickly than any other type of equal power, with the exception of the rotary.

(*h*) Provided the aeroplane *fuselage* is properly designed, the radial is ideal for mounting. It can be so arranged that the engine may be taken out or put into the machine in very much shorter time than is possible with the vertical or "V" types.

Some Disadvantages of Air-Cooled Radials, and Some Suggestions for Remedying Them

All design is a matter of compromise, and Mr. Fedden called attention to certain special problems peculiar to the radial, which, he said, were worthy of weighty consideration. It is Mr. Fedden's opinion that these problems are not insuperable, but that designers of this type have not realised the amount of "new ground" that had to be broken. He then proceeded to discuss some of the problems in detail.

(1) *Regarding the air-cooling of large cylinders*, Mr. Fedden pointed out that, on the whole, the design has been poor and entirely inadequate to deal with the mean effective pressures demanded.

"It is," the lecturer said, "possible for large air-cooled cylinders to run as cool as water-cooled cylinders of equal capacity." He then stated that his own experience had been chiefly gained with air-cooled cylinders of 5¾-in. bore and 7½-in. stroke, and that any figures mentioned in the following remarks refer to cylinders of these dimensions. Mr. Fedden

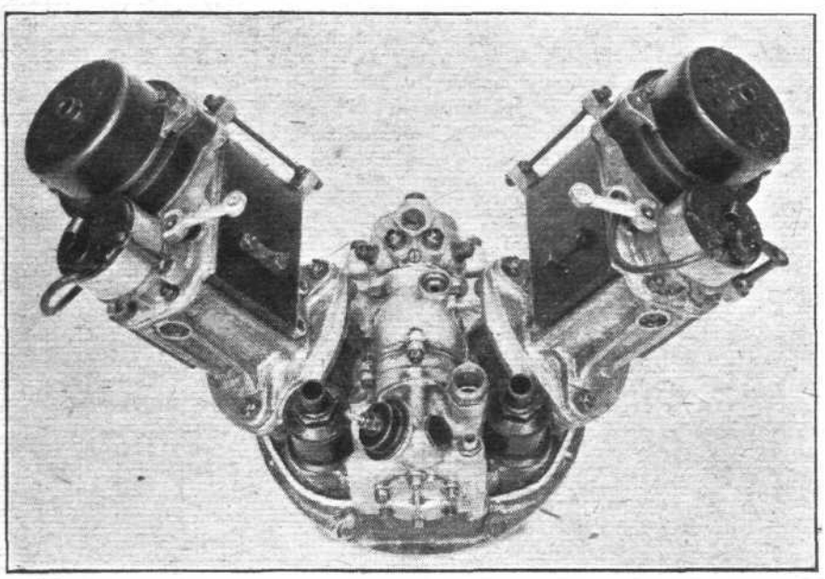


Fig. 8.—Rear cover assembly of "Jupiter" engine.

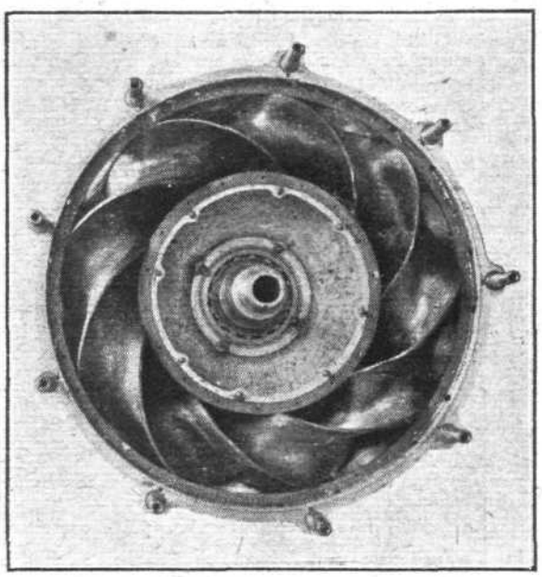


Fig. 9.—Induction spiral of "Jupiter" engine

stated that sufficient attention has not been given in the past to the cooling of the cylinder head. He then continued :

"Overhead valves are essential, but the vertical type is favoured, as the push-rod mechanism becomes so very complicated with inclined valves, and excellent mean effective pressures can be obtained with vertical valves. Multi-valves are necessary with the size of cylinder named—two inlet and two exhaust being recommended. The arrangement of a four-valve air-cooled head requires much consideration and experiment. Eight different types of cylinders have been exhaustively tested out by the author's firm."

"The best compromise has been found to be a closed ended steel cylinder machined from the solid with integral fins with an aluminium head attached thereto, carrying the valve ports. Tests have shown that for a given bore of cylinder a fairly definite compression ratio will give the minimum wall temperature, 5 to 1 compression ratio being used for the cylinder under consideration. Since the weight of a circular fin varies as the square of the length of fin, it is important to keep these fins as short as possible. For the steel barrel, triangular-shaped fins 0.3-in. pitch have been found most suitable. These barrels are made from 40-ton carbon steel."

"The aluminium heads should be cast from a copper alloy, and be well annealed before machining to force the "growth" and eliminate distortion. The foundry difficulties of producing castings with integral fins limit somewhat their scope and correct shape ; 0.406-in. pitch for the cylinder heads has been found most practical. With a large air-cooled cylinder of the capacity named above, to maintain a good mean effective pressure and petrol consumption, the maximum temperature of the head should not exceed 300° C. The cooling area should be not less than 0.25 sq. ft. per brake-horse-power. Tungsten steel has been found most suitable for the exhaust valve. The temperature at its hottest point should not exceed 660-680° C."

"A cylinder of 5¾-in. bore and 7½-in. stroke with the above characteristics, will maintain continuously 45 b.h.p. at 1,600 r.p.m., 115 m.e.p., and 52.5 b.h.p. at 1,800, 118 m.e.p., in an 80 m.p.h. wind, with a 0.58 pt. per brake-horse-power consumption, and the working parts of the cylinder will be in good condition at the end of long periods of running."

(2) "*The big-end bearing assembly* of a static radial engine requires very careful attention, and the majority of designs have not provided sufficient bearing surface to maintain a long life. At first sight it would appear that a roller-bearing big end would be a satisfactory solution, especially as this type of bearing offers advantages on the score of lubrication. In practice, however, it will be found that the peripheral speed of the rollers is very high, and the weight of the big-end excessive. Also this design necessitates a built-up crank-shaft. The author advocates a solid crank with a master rod construction, and white metal big-end."

"The master rod is subjected to a heavy alternating load, and factors of safety of 5.5 to 1 for the shank, and 3.4 to 1 for the small end, should be provided. Oil grooves in the white metal should be avoided, a flat on the crank-pin being preferable."

"Disregarding altogether torsional stress, the importance of a rigid big-end assembly to avoid spring and consequent cracking of the white metal, cannot be too strongly emphasised."

"It is, of course, very necessary to provide for adequate lubrication, and the greatest care should be taken in the detail design of the pump, strainers and lubrication system generally. It is vitally important to provide sufficient

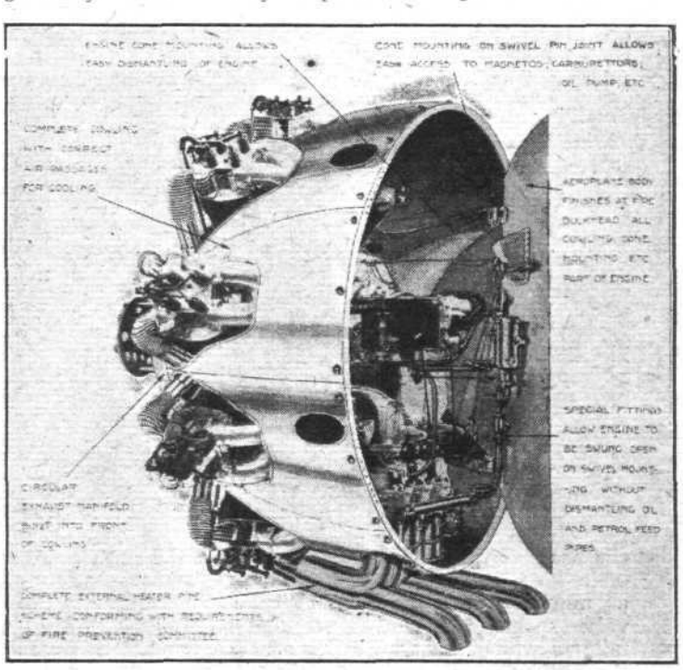


Fig. 10.—Cone swivelling mounting of "Jupiter" engine.

pressure to maintain the oil film and pass sufficient oil through the big-end to dissipate the heat."

"With a big-end construction as outlined above giving a mean load factor of 12,000 lbs. per sq. in./ft. per sec,, and with an oil pressure of 35 lbs. per sq. in., an excellent life to the bearing is possible, comparing favourably with the

very best "in line" or "V" type engines. The ratio of connecting rod to crank should not be less than 3.5. Short connecting rods considerably increase the side thrust and mean temperature of the cylinder walls."

(3) "*Valve Mechanism.*—The valve mechanism of static radial engines has been a constant source of trouble in the past, and the larger the size of the cylinder, the more acute this problem becomes. The author has given considerable time and thought to endeavour to eliminate the generally accepted push-rod mechanism, but is of the opinion that, at any rate for cylinders up to 6-in. bore, this construction is the most satisfactory. When really large cylinders are considered, it will probably be desirable to have individual vertical-bevel drives to each cylinder."



Fig. 11.—Mounting of "Jupiter" engine in Bristol "Bullet" aeroplane.

"Assuming that the push-rod arrangement is the best for cylinders up to 50 h.p. per unit, it is proposed to detail methods for eliminating the weak points of this component. The reciprocating weights of this mechanism must be reduced to the minimum, excessive valve clearance eliminated, and first-class workmanship be put in the manufacture of the cam-sleeve. The accelerations, and especially the decelerations, of the cams must be very carefully watched. The cam-sleeve must therefore be accurately former-ground. Hand-made cams filed to template, although correctly designed on paper, may produce very high momentary loadings."

"Excessive valve lifts and large valve clearances must be obviated. The latter is a serious problem with large air-cooled cylinders, when the rocker mechanism is positively fulcrumed on the cylinder head. As the cylinder heats up, the head carries the rockers away from the push rods, and on a large cylinder of 7½-in. stroke this clearance may be as much as 0.060-0.070 in. With such clearances, broken valve springs and valves breaking off under the head are failures which must be expected. To remedy this trouble, the author is of the opinion that it is absolutely necessary to introduce some method of automatically taking up the valve clearance as the engine warms up. The loading of valve springs is in most instances too high. The shear stress should not be more than 40,000-45,000 lbs. per sq. in."

(4) "*Uneven Distribution of Mixture.*—On all multi-cylinder engines the question of even distribution is one that has received much thought and attention. On static air-cooled radials this matter has been neglected, because the problem is, if anything, more difficult than on an ordinary "in line" engine. The results have been poor volumetric efficiencies, high consumptions and burnt exhaust valves on isolated cylinders."

(5) "*Pistons.*—Aluminium is the most suitable metal for pistons. The same alloy should be employed as for the cylinder heads, and the preliminary "growth" carried out before machining. The author's company developed and tested out at great length seven distinct types of piston before arriving at an entirely satisfactory result. The mass of metal in the piston at one's disposal must be very carefully disposed. One ounce of metal added to a piston of 5¾-in. bore represents only 0.0625 lb. additional reciprocating weight, but represents 78 lbs. additional loading on the big-end of the complete engine. A satisfactory piston for 5¾-in. bore cylinder should not exceed 2¾ lbs. Webs and sharp corners should be cut out as much as possible, as both are prolific causes of cracks."



Fig. 12.—Mounting of "Jupiter" engine in Bristol "Badger" aeroplane.

Present State of Development of Air-Cooled Radials

Having outlined methods for dealing with the problems peculiar to static air-cooled radial engines, Mr. Fedden proceeded to deal with the latest type of engine developed by his company—*i.e.*, the Bristol "Jupiter." This last part of the paper was mainly descriptive, and refers to the accompanying illustrations. He mentioned that the "Jupiter" has recently passed the 1920 type-test of the British Air Ministry, and has obtained its Civil Airworthiness Certificate. The tests extend over 54 hours, and are extremely rigid and strenuous. "Only two other makes of engines," Mr. Fedden said, "and these water-cooled and of greater weight per b.h.p., have ever passed this test, and the Bristol 'Jupiter' is the first and only static air-cooled radial to obtain this certificate. It will therefore be realised that the static air-cooled radial is now a really proved proposition. The official weight of the engine complete is 729¼ lbs., which is equal to 1.92 lbs./b.h.p."

"Fig. 1 shows the official power curves of the 'Jupiter' engine, Curve A being the power curve at the commencement of the type test, and Curve B being the power curve at the end of the 54 hours. The average petrol consumption throughout the 54 hours' test was 0.594 pt. per b.h.p. hour; the average oil consumption, 0.049 pt. per b.h.p. hour. At the end of the test the engine was stripped down for examination. Very few signs of wear were found, and the general

condition was excellent. The engine was then re-erected and a further power curve taken. Fig. 1, Curve C, shows the power developed, the maximum being 462 at 1,840. These figures are not snatch readings, but the power that can be sustained. The engine was then run for two hours as follows :—

440 h.p. at 1,775 r.p.m.
450 h.p. at 1,840 r.p.m.

" These figures show that the engine has an ample margin of power, and that the main components of the engine are not over-stressed, although the revolutions are excessive for this type of engine for long periods—the normal rating being 380 h.p. at 1,575 r.p.m. The Type Test also included half an hour's slow-running test at 393 r.p.m.—the engine accelerating to normal revolutions within five seconds."

" The author is of the opinion that the provision of proper test plant is a matter of the utmost importance, and has been sadly neglected in the past. Fig. 2 shows a test bed for multi-cylinder engines up to 600 b.h.p., and Fig. 3 a similar plant for testing single-cylinder units up to 65 b.h.p. Reference to Fig. 2 will show that the engine is mounted on a bearer plate, and is spigoted thereto just as in the aeroplane *fuselage*. This bearer plate is attached to a stand which is mounted on rollers, the torque reaction being taken by spring buffers. The engine is coupled by means of two universal joints and a cardan shaft to a Heenan and Froude water dynamometer. The tail-shaft of the dynamometer is coupled through a dog-clutch to a 100 h.p. variable-speed motor. This motor is used for ' running in ' and starting the engine."

" A 65-in. fan located in a pit outside the test-house, and direct-driven by a 270 h.p. shunt-wound motor, supplies air at an average velocity of 85 m.p.h. This air flow can be varied at will. A 110-gall. tank supplies petrol to the engine through three flowmeters for measuring the fuel consumption. A 9-gall. electrically heated tank supplies oil, the tank being heated to 50° C. to represent flying conditions. Special apparatus is arranged for measuring the temperature of the cylinders and valves while the engine is running."

" Fig. 3 shows the single-cylinder bed, which is a replica of the main stand in all details. Figs. 4 and 5 show front and back views of the Bristol ' Jupiter ' engine."

" Fig. 6 shows a detailed view of the cylinder and head, and the patented valve-rocker mechanism. It will be noted that the valve-rocker mechanism is mounted on a bracket which is independent from the cylinder head. This rocker fulcrum bracket is anchored by an eye-bolt to the centre of the head, and by a tie rod to the crank-case of the engine. As the cylinder heats up and grows, this fulcrum bracket is automatically drawn down by the tie rod from the crank-case, and so allows the valve clearances to remain constant."

" Fig. 7 shows the crankshaft, connecting rod and piston assembly complete. The rigid construction of the crank and connecting rod will be noted. Attached to the webs of the cranks will be seen two trailing spouts for taking away the surplus oil from the big-end bearing. These spouts rotate in two concentric slots in the sides of the crank-case from which the oil drains away into the isolated sump.

" Fig. 8 shows the back-cover assembly complete, ready to bolt to the rear end of the crank-case, and demonstrates what a compact unit this may be made. On this cover are mounted the two magnetos, two oil pumps, two strainers, oil relief valve, tachometer drive, and distributor for the gas starter."

" Fig. 9 is a view of the rear end of the crank-case showing the patented spiral induction system. This consists of a three-" start " spiral casting fitted to an annular chamber in the back half of the crank-case. Each of the three " starts " in the spiral is fed by one carburettor, which in turn feeds three cylinders. There is therefore in effect three separate insulated spiral-induction systems, fed by three separate carburettors. This arrangement supplies an absolutely even mixture throughout the engine. Further, should one cylinder fail for any cause, the whole carburation system is not upset and the engine cut out, as has been the case on other types of engines. Instead, with this triple spiral-induction system only the number of cylinders (viz., three) fed by the particular spiral are cut out, and these cylinders being equally disposed, the balance of the engine is not materially affected. To prove out this scheme, a one-hour test has been run under Government supervision, with the petrol turned off from the centre carburettor. The engine ran quite steadily the whole time and developed 193 b.h.p., and within five seconds of turning on the petrol the engine picked up to full load."

In conclusion Mr. Fedden said a few words about mounting radial air-cooled engines :—" In the past many radial air-cooled engines have never had a proper chance owing to bad mounting. The author is strongly of the opinion that engine-designers are the right people to design the engine-mounting for all types of engines—no matter whether they be air-cooled or water-cooled—and that the sooner this fact is established the better it will be for the development of aeronautics generally."

" The mounting of air-cooled radials has been so very much abused in the past, and this type of engine offers such unique opportunities for unit mounting, that it is considered that all air-cooled radials should be supplied complete by the engine-makers with mounting and cowling, and actually tested with these components. Fig. 10 shows the Bristol ' Jupiter ' engine correctly mounted as a complete unit. The illustration is self-explanatory, and is, the author submits, worth careful investigation. This mounting eliminates fire risk, and enables a 380 h.p. engine to be changed in the field in comfortably under two hours—a matter of the greatest importance both for civil and military work."

" At the present time, 45 h.p. per cylinder is the limit which has been attained for air-cooled cylinders at suitable r.p.m. and to maintain really first-class reliability. It is, however, believed that this is by no means the limit for this type of cylinder, and that in the next few years it may be expected that satisfactory air-cooled radials up to 1,000 h.p. and weighing under 2 lbs./b.h.p. will be an established fact."

Resignation of Sir C. F. Lambert, K.C.B.

VICE-ADMIRAL SIR C. F. LAMBERT, K.C.B., having been placed on the retired list of the Navy, at his own request, as already announced, is also relinquishing his appointment of Director of Personnel at the Air Ministry, and his position as additional member of the Air Council.

M. Michelin Retires

OWING to the state of his health, M. Michelin has felt compelled to resign the Presidentship of the Aero Club of France. M. Michelin has been a valuable asset to aviation from the earliest days, and his resignation must prove a severe loss to the French Club.

Germany and War 'Planes

FROM Berlin the figures given for aircraft destroyed, etc., up to October 1 last are 127,471 aeroplanes and 20,364 aero engines destroyed and 629 aeroplanes and 3,632 aero engines surrendered.

Gordon-Bennett Balloon Race

IT has been decided—until such time as they may alter their views—by the Aero Club of Geneva that the 1922 Gordon-Bennett Balloon Race is to be held on September 2 and start from Geneva. Zurich in this connection proposes to organise an aviation meeting.

R.A.F. Club

THE R.A.F. Club will shortly be housed in its new club-house in Piccadilly, one time the home of the Lyceum Club, and next door to the Cavalry Club. Like the R.A.C., the R.A.F. Club has its own swimming bath.

A Ford Aeroplane

FROM New York comes the announcement that Mr. Ford proposes to launch out into aeroplane-building—presumably for commercial purposes. As the names of Admiral Sims and Mr. Edison are coupled with the new departure, there may be possibilities in it. But turning out safe 'planes is hardly one to conduct on the same lines as the launching of " Tin Lizzies " by the 100,000, more or less, per day.

A Message from F. Warren Merriam

WE have received from our old friend, Captain F. Warren Merriam, the following message, which we publish in the hope that it may reach those concerned :—

" To my numerous pupils and friends : As I am about to publish a book embracing the flying career of my pupils and self—from the early days of flying, and on—and which will at the same time record in it facts relating to the Great War, so far as the Air Services are concerned—I should deem it a great and personal favour if any of you would be so kind as to forward to me (c/o The Royal Aero Club, 3, Clifford Street, W. 1) any anecdotes or incidents that you know of in connection with the above. In fact, any information relating to flying and administration in the Services, that would help to make this volume a success as an educative power, in humour and interest, would be welcome.

" Wishing one and all the Compliments of the Season.

Yours very sincerely,
F. WARREN MERRIAM."

LONDON TERMINAL AERODROME

Monday Evening, December 12, 1921.

THE "airway" service has again been spasmodic throughout the week. Northern France has been persistently foggy, and even on days when the weather has been "O.K." at Croydon, and as far as the Channel, it has been no use starting, owing to bad visibility over the other side.

The Disposal Company have been trying to get a big batch of machines away to Brussels; but, although some pilots have manged to scrape through, the weather, generally, has been too bad for anything like regular delivery. Mr. Shaw had an exciting time on this air journey on Thursday. He had Mr. Piercy as passenger, and though the clouds were at least 5,000 ft. high, until near Brussels, they then descended earthward with alarming rapidity, until Mr. Shaw was leaning from one side of the machine, and Mr. Piercy from the other, "looking out for factory chimneys."

Mr. Perry has severed his connection with Handley Page Transport, and is now waiting to go out to Roumania for the Disposal Company. Several aeroplanes have been sold to the Roumanian Government, and Mr. Perry is to superintend their erection and then test each machine before handing it over.

Captain Muir, of the Surrey Flying Services, has started joy-rides again, but there is not much doing in such a direction at this time of the year. He is also busy, with the assistance of Mr. Grant and his staff of mechanics, building up an Avro for the Marconi Co., to replace the "D.H.6" which was crashed badly a little while ago. Mrs. Atkey, who has been getting a deal of practice in the dual-controlled Avro, has now made several good solo flights, and Captain Muir, who has acted as instructor, is very pleased with the progress made.

Another New "Air Express"

A NEW "D.H.18" has been delivered to the Air Ministry, and is now housed in the sheds at Croydon. It has several interesting new features, and looks a very workmanlike machine. The entire *fuselage* is covered with three-ply while the lines of the *fuselage* certainly appear slimmer than in previous models. There is a hand-turning device for starting the engine, and a collapsible platform has been provided at the side of the motor for the mechanic to stand on when starting up. This platform folds up against the side of the *fuselage* when not in use.

Major Foot has been waiting for the weather to clear sufficiently for him to take one of the "D.H.9's" to Zurich for the Disposal Co. Four of these machines have been ordered, and are now awaiting delivery.

Start of a Record "Air-Taxi" Trip

MR. COBHAM arrived about one o'clock on Friday in a "D.H.9c," to have his compass swung. After some difficulty this was got right, and Mr. Cobham made off towards Paris, only to find that the furthest it was safe to go, owing to approaching darkness, was Lympne. So far as can be ascertained, this was the start of what will be the longest "air-taxi" trip yet attempted. Two passengers will be picked up in Paris, and Mr. St. Barbe, of the De Havilland Aircraft Co., from whom the machine was hired, informs me that the machine is to travel to Spain, Morocco, Algiers, Italy and on to Constantinople, returning to Paris by way of Central Europe.

Mr. Basil Curtis, of the Gas Accumulator Co., Brentford, was at the aerodrome during the week, putting finishing touches to the "Cone" light, and new lenses in the lighthouse. He tells me that the complete scheme of lighthouses and cone-lights is now settled, and that the foundations for the lighthouse on Titsey Hill are actually laid. This lighthouse will be mounted on a 30-foot tower, and is to be the one which is at present at Croydon. Another and more powerful lighthouse is to be erected on a 50-foot tower at Cranbrook, in Kent, and there is already a cone-light at Lympne.

In addition to these lights there is to be erected, partly as an experiment, a new "T" light at Croydon. This will be a huge swinging "T," illuminated at night. It will also have coloured lights which will show, automatically, the strength of the wind. If this "T" is successful, I understand that a number of them are to be erected in large fields between Croydon and Lympne to act as indicating and landing lights for emergency descents.

There is great activity in lighting generally on the aerodrome. Tests are to be made with a new wide-angle searchlight lens at an early date.

CLEANING-UP A RACER

The "Mars I" Ready for Martlesham

WHEN the "Mars I," designed by Mr. H. P. Folland, and built in a few weeks by the Gloucesterhsire Aircraft Co., made its first public appearance at Hendon for the Aerial Derby, it was fast enough to win that race and also the sealed handicap.

Although the machine then looked very pretty indeed, it was clear to those who make a close study of aeroplanes that several details yet required "cleaning up." In the incredibly short time in which the machine was designed and built there was no opportunity for very minute refinements, and the machine was, to use Mr. Folland's own expression, "a very rough job." At the time one disagreed, but having seen the machine in its latest form, it must be admitted that it was rough then compared with now.

Then came the Coupe Deutsch, for which no other British firm was sporting enough to enter a machine. It thus rested with the "Mars I" to maintain the prestige of British designers and constructors. For this race the machine had been provided with smaller wings, but otherwise its details were left, much as they were in the Derby. Lamblin radiators had, however, been fitted, and these were found to add very considerably to the speed of the machine, in spite of the conclusions arrived at by the experts at the R.A.E. How failure of the fabric stitching prevented James from showing the world what the "Mars I" really could do, is now a matter of history. The machine was sent back to Cheltenham, and then commenced the process of "cleaning up."

During last week, the "Mars I" was on (private) view in the old Cricklewood works of the Nieuport and General Aircraft Co. Invitations were extended to a few privileged persons to come and inspect the machine, and among others who availed themselves of this opportunity were representatives of a number of foreign Governments. Needless to say, the machine created a very favourable impression, and it is we think, to the ultimate good of the British aviation industry, generally, that our fastest machine should be open to inspection by the representatives of other nations. The machine is now very highly finished, and is ready for its official speed tests at Martlesham, which will, it is hoped, take place as soon as weather conditions permit.

In its present form the "Mars I" is a joy to behold. Its lines were ever very beautiful, but the detail refinements now incorporated and the excellent finish help to make the machine more pleasing than ever. The wings are finished in snowy white and the *fuselage* in blue, the doping scheme being one of the Titanine racing schemes. The surfaces are very highly polished, and at the high speeds which it is hoped to attain, this fact should add considerably to lessening the resistance.

In the matter of detail refinements, it may be mentioned that one of the Lamblin radiators has been removed, as it is considered that one will be sufficient. This is mounted centrally under the body, between the vees of the undercarriage. Sheet metal casings have been put over the corners of the I-struts where these join the planes, so that now the curve of the struts runs gradually into that of the wings. The greatest improvement is, however, the cowling-in of the upper bank of cylinders of the Napier "Lion." The cowling now takes a smooth curve from the nose up over the top of the engine, and the two side banks of cylinders have streamline tail pieces placed behind them so as to leave no discontinuity of surface.

In order to reduce the resistance of the undercarriage, the rubber shock absorbers have been almost totally covered-in streamline fairings, and the wheels themselves have been faired by flat sheet metal cones placed behind them. There is only about ¼ in. gap between the tyre and the fairings, so that there should be little risk of the fairings blowing off. In any case, they are substantially attached to the axle by streamline tubes. Altogether the machine now looks the typical racer, and there is little doubt that its speed will have been considerably increased. To how great an extent is impossible to say, but we should be surprised personally if 190 m.p.h. is not exceeded. Needless to say, the machine will be flown by Mr. James, and we are sure that all our readers will join us in wishing him the best of luck.

FLIGHT

THE ROYAL AIR FORCE

London Gazette, December 2

Memoranda

Hon. Sec. Lieut. J. H. Payne relinquishes his honorary commn.; January 6 1920. Flying Officer G. M. Cox to be Honorary Flight Lieut.; December 2. Sec. Lieut. (Hon. Lieut.) C. J. Poole to be Lieut. (T., Grade B.), with effect from April 2, 1918, but without pay and allces. of that rank, prior to September 8, 1918. (Substituted for *Gazette* September 17, 1918, October 31, 1919, and October 4, 1920.) The notification of the award of the Meritorious Service Medal to 780 Sgt. G. W. Hepple, R.A.F., in *Gazette* October 28, is cancelled, this non-commissioned officer having been awarded this decoration in *Gazette* of November 10, 1916.

London Gazette, December 6

General Duties Branch

The following are granted short service commns. as Pilot Offrs. on proba tion, with effect from, and with sen. of November 28:—E. C. Barlow, *C. A. Goatcher, *R. C. Harrison, H. K. Waterfield. * Denotes previously served in R.A.F.

The following Observer Offrs. (Lieuts. Army) are re-seconded for a further two years' duty with the R.A.F.:—J. E. Maclennan (Cameronians); December 6. C. D. Palmer (Argyll and Sutherland Highlanders); November 24.

The following Flying Offrs. are restored to full pay from half-pay:—C. W. Attwood; November 22. G. Y. Tyrrell, M.C.; December 3.

Flight-Lieut. P. B. Hunter is placed on half-pay, Scale B.; December 12. Flying Offr. F. Williams, M.C., D.F.C., is placed on the retired list on account of ill-health contracted in the Service, and is granted rank of Capt.; December 7. Flying Offr. R. Sterling, D.F.C., relinquishes his short service commn. on account of physical unfitness for flying duties, and is permitted to retain the rank of Lieut.; December 7.

Stores Branch

C. W. Rugg is granted a temp. commn. on probation as a Pilot Offr.; March 5 (substituted for *Gazette*, March 15.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

Wing-Commander — J. C. Halahan, C.B.E., A.F.C., from R.A.F. School (India) to command No. 2 Wing (India). 24.10.21.

Flight-Lieuts.—V. R. Scriven, A.F.C., from No. 10 Group Headquarters (Coastal Area) to H.M.S. "Pegasus" (Mediterranean Group). 22.11.21. A. Roberts from No. 2 Wing Headquarters (India) to School of Army Co-operation (Inland Area). 20.10.21. (To join 19.1.22.) P. A. Hall, M.B., B.A., from R.A.F. Depôt (Inland Area) to No. 84 Squadron (Middle East Area). 24.11.21. W. W. Hart, M.B.E., from R.A.F. Depôt (Inland Area) to No. 2 Wing Headquarters (India). 24.11.21. C. R. Keary from R.A.F School (India) to No. 1 Wing Headquarters (India). 10.10.21. T. Montgomery, M.B., D.P.H., B.A., from No. 8 Squadron (Middle East Area) to No. 30 Squadron (Middle East Area). 11.10.21. F. J. Murphy, M.B., from No. 84 Squadron (Middle East Area) to No. 1 Squadron Middle East Area). 11.10.21. J. Kyle from No. 47 Squadron (Middle East Africa) to Headquarters, Middle East Area. 9.9.21. C. T. O'Neill, M.B., from No. 70 Squadron (Middle East Area, to No. 216 Squadron (Middle East Area). 11.10.21. J. Wren from No. 70 Squadron (Middle East Area) to Headquarters (Middle East Africa). 15.11.21. D. G. Boddie, M.B., from No. 56 Squadron (Middle East Area) to Stores Depôt (Middle East Area). 10.11.21. A. S, Cheshire, M.B.E.; from School of Photography (Inland Area) to No. 5 Flying Training School (Inland Area). 8.12.21. M. L. Taylor, A.F.C., from No. 5 Flying Training School (Inland Area) to School of Photography (Inland Area). 8.12.21. H. Cockerell, O.B.E., from Marine and Armament Experimental Establishment (Coastal Area) to Iraq Group Headquarters (Middle East Area). (Supernumerary). 26.11.21. A. Fitz-Roy Somerset-Leeke from No. 1 School of Technical Training (Boys) (Halton) to Iraq Group Headquarters (Middle East Area). (Supernumerary). 26.11.21. L. O. Brown, D.S.C., A.F.C., from School of Naval Co-operation and Aerial Navigation (Coastal Area) to Iraq Group Headquarters (Middle East Afriea). (Supernumerary). 26.11.21. G. H. Errington. The notification wherein this officer was posted from Headquarters, Coastal Area, to R.A.F. Depôt with effect from 1.11.21, is cancelled.

R.A.F. BOXING

ON December 8 the competitions for novices, arranged by the R.A.F. Boxing Association for the Sir Charles Wakefield trophies, were concluded at Halton Camp, Wendover. The participants on December 8 in these finals were those qualified from preliminary competitions in the various areas, a proviso being that a competitor should not previously have won a competition confined to the R.A.F.

Sir Charles Wakefield in a speech advised boxing as a means of keeping fit; as a training for the brain, the eyes, the nerves, and the temper. Boxing at its best was the modern equivalent of knightly chivalry in the old-time lists, and many a man had proved himself in the ring a White Knight. He was always delighted to be able to encourage the sport, as he believed it developed character, as well as physical fitness, and hard, clean-living bodily habits.

The Officers' Cup was won by No. 7 Group (Andover) with a total of 21 points, the R.A.F. (Halton) being second with 11, and No. 1 Group (Kenley) third with 10. Results:—

Officers—Feather-weights

Semi-final.—Flying-Officer Walker (25 Sqd. No. 1 Group, Kenley) knocked out F./O. Humphreys (Halton) in the first round. F./O. Carter (No. 7 Group, Andover), a bye.

Final.—Walker beat Carter on points.

Bantam-weights

Final.—F./O. Birkett (No. 7 Group, Andover) beat F./O. Deaman (Halton) in the first round.

Welter-weights

Semi-final.—Flight-Lieut. Angell (Halton) beat F./Lieut. Nunn (Felixstowe) on points. F./Lieut. Rayner (No. 7 Group, Andover), a bye.

Final.—Rayner, w.o., Angell, scr. (owing to injured hand).

Light-weights

Final.—F./Lieut. Troup (Halton), w.o.; F./O. Bucknell (Cranwell), absent.

Middle-weights

Semi-finals.—F./Lieut. Smith (Uxbridge and A.M.), beat F./O. Dann (Halton) on points. F./O. Porter (No. 7 Group, Andover) beat F./Lieut. Darwin (Cranwell) on points, after an extra round.

Final.—Porter beat Smith on points.

Light-heavy-weights

Semi-finals.—F./O. Farrow (No. 7 Group, Andover) beat Wing-Commander Cave-Brown-Cave (Halton) on points. F./O. Burge (Isle of Grain), a bye.

Final.—Farrow beat Burge on points.

Heavy-weights

Semi-final.—F./O. Hall (No. 1 Group, Kenley) knocked out F./O. White (Halton) in the first round. Sqd.-Ldr. Miles (Andover), a bye.

Final.—Hall beat Miles on points.

Other Ranks—Fly-weights

Semi-finals.—A.C. 2 Minton (Halton) beat A.C. 2 Boothby (Isle of Grain), the latter retiring in the last round through an injured hand. A.C. 2 Fort (Henlow) beat A.C. 2 Lawler (No. 7 Group, Andover) on points.

Final.—Minton beat Fort in the second round.

Bantam-weights

Semi-finals.—A.C. 2 Bridge (No. 7 Group, Andover) beat A.C. 2 Hughes (Halton) on points. A.C. 1 Radcliffe (Henlow) beat A.C. 2 Warren (No. 10 Group, Lee-on-Solent) on points.

Final.—Radcliffe beat Bridge on points after an extra round of 2 mins.

Feather-weights

Semi-finals.—A.C. 2 Griggs (Henlow) beat A.C. 2 Kinsman (Winchester). A.C. 2 Jackson (Halton) beat A.C. 2 Ashbolt (Isle of Grain) on points.

Final.—Jackson beat Griggs on points.

Welter-weights

Semi-finals.—A.C. Williams (Cranwell) beat L.A.C. Buckle (I.A.A.D., Henlow). A.C. Bill (Halton) beat A.C. Harrison (No. 7 Group, Andover) in the second round.

Final.—Bill beat Williams on points.

Middle-weights

Semi-finals.—Cpl. Kerby (Halton) beat A.C. 2 Ballantyne (No. 7 Group, Andover) in the first round. A.C. 2 Hayte (No. 10 Group, Lee-on-Solent) beat A.C. 1 Garner (Uxbridge) on points.

Final.—Kerby k.o. Hayte in first round.

Light-weights

Semi-finals.—A.C. 2 Church (Cranwell) beat A.C. 2 Crank (Halton) in the second round. A.C. 2 Williamson (Henlow) beat A.C. 1 Yeomans (Air Ministry and Uxbridge) on points.

Final.—Williamson beat Church in second round.

Light-heavy-weights

Semi-finals.—A.C. Williams (Halton) beat A.C. Addison (No. 1 Group, Kenley) on points. A.C. 2 Wishart (No. 7 Group, Andover) beat Cpl. Cross (Henlow) on points.

Final.—Williams beat Wishart on points.

Heavy-weights

Semi-finals.—A.C. 2 Johnson (Halton) beat A.C. 2 Deans (Uxbridge) in the second round. A.C. 1 Grain (Henlow) beat A.C. 2 Lockett (No. 7 Group, Andover) on points.

Final.—Johnson k.o. Grain in second round.

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

SOARING FLIGHT

[2048.] Dr. Hankin in his letter (2046) of your issue of 24th ult. states that, if his observations are correct, it is improbable in the highest degree that the soaring of birds at the stern of a steamer is due to ascending currents. I have not had an opportunity of observing the soaring of gulls near a ship, but it is perhaps not generaly known that ascending currents do usually exist in the neighbourhood of the stern of a steamer. Unless the ship is steaming absolutely into the wind or with the wind, there will be an ascending current at every point along the windward edge, the side of the ship acting as a cliff with the wind at grazing incidence. The up-currents are present up to a height of some 30 to 50 ft. above the highest deck of the ship, and persist for some distance abaft the ship. On the leeward side the air is descending. In gusty weather it is possible for the relative wind to oscillate some few degrees from port to starboard. Three degrees of yaw in the relative wind is often sufficient to give rise to up-currents of 1 or 2 ft. per second on the windward side abaft the stern. It would appear, in view of the fact that the relative wind is in general at least three degrees off the fore and aft line of the ship, that there would nearly always be a region of ascending air near the stern. I should imagine that gulls would make full use of the rising currents in this region.

My information is based on actual experiment in connection with the work of the laboratory. L. W. BRYANT

Aerodynamics Department,
The National Physical Laboratory,
Teddington, Middlesex,
December 3, 1921.

WHAT'S WRONG WITH AVIATION?

[2049.] Although I have retired from the aviation industry it still attracts me, and I read my FLIGHT regularly every week. There is just one point in Col. Searle's paper, extracts of which you publish, which should not be allowed to pass.

Col. Searle says, in connection with the necessity of air transport service being at a reasonable maintenance cost, that the question of cost did not assume the same importance in war-time as it does in peace. Again, on the subject of the correct position of sheds in aerodromes, he repeats that it was not necessary to count the cost during the War.

Col. Searle in his paper showed such a very shrewd and original grasp of the subject that I was surprised he should repeat the loose thinking of other people. During the War we were short of two things, *i.e.*, men and material. Nobody will dispute it, as it was repeated *ad nauseam*: yet at the same time—also *ad nauseam*—came the parrot-cry, "You must not count the cost during war."

Unfortunately, people appeared to give lip-service to the first axiom, yet wasted both labour and material far too freely and patted themselves on the back for being so wise as to have heard of the old military axiom, which was only meant to be adopted on very special occasions and not meant to be taken in large doses before, during and after every meal.

What the aeroplane industry—like many other industries—is suffering under today is not realising that we are back again in the good old pre-War competitive days, and that if one wants bread-and butter one must work for it. If it was not that I am busy with another bit of pioneer work, I would certainly return to aviation, for there is a fortune to be made by anyone who puts anything like the pre-War energy and enterprise into the industry.

"OCTOPUS"

PILOTS AND THEIR FEES

[2050.] My attention has been called to the paragraphs relating to this Company, which appear in your issues of December 1 and 8. The grossly inaccurate statements they contain are calculated to seriously injure the reputation and business of this Company, and my directors view the matter with grave concern. In particular, the figures quoted as representing the payments made by us to pilots for taking machines to Brussels and including expenses are false, as the sheet* of extracts taken at random from our pilots' account sheets will show.

Further, our machines are always thoroughly tested at our Waddon works and aerodrome before leaving for Brussels and elsewhere, and we can also show that considerable sums are expended in this direction.

The reflections cast upon this Company are so serious, that I am sure you will recognise the desirability of publishing this letter at once, and of withdrawing the paragraphs complained of.

For and on behalf of AIRCRAFT DISPOSAL CO., LTD.
Dec. 13. M. W. DARBY, *General Manager.*

* Dates and particulars of payments made to pilots for single flights to Brussels :—Sept 21, 1921, £11 3*s.*, £13 4*s.* 9*d.*, £10 9*s.* 3*d.*; Sept. 22, £10; Sept. 28, £10; Oct. 8, £11 5*s.*; Oct. 19, £10 4*s.*; Nov. 23, £14 1*s.*; Nov. 28, £14 14*s.* 9*d.*; Dec. 1, £17 2*s.* 7½*d.*; Dec. 2, £14 3*s.*; Dec. 8, £12 15*s.*

[The references to which the above letter applies appeared in our Croydon correspondent's notes.—ED.]

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A Beautiful Almanac

FOR 1922 the Abdulla Almanac, just to hand, surpasses anything this celebrated Bond Street cigarette firm have previously turned out. During the War period, the very beautiful calendars issued each year simply made one wonder how it was done. But then the Abdulla firm were inspired by their great contributions to the Red Cross Fund by means of this remarkable calendar. The usual baker's dozen of picture reproductions in colours go to make up the 1922 year's set, and it is difficult to say which is the more attractive, each having such sound merit of its own. Aviation has a place in the series in "First Studies in Aviation," a pictorial fantasy in Chinese fashion, by Warwick Reynolds. Particularly charming are "Waiting till the Ship Comes Home: A Dutch Idyll," by H. John Pearson, and "On the Shores of Lake Siljan," by E. G. Ekdahl. The broad colouring of Lionel Edwards' "A Ride through the Fair" is well suited to the Spanish scene presented. The production as a whole is in keeping with the high quality of the cigarettes for which the Abdulla Co. have justly become famous.

The London Aero Models Association

IT was an enthusiastic gathering of members and friends at the First Annual Dinner of this Association held at the headquarters, 20, Great Windmill Street, W., on Thursday of last week. Mr. A. E Jones, the President, was in the chair, and while speech-making was kept down to the minimum, it was to the point, and emphasised the practical aim of the Association. That the visitors were impressed by the enthusiasm and sincerity of the members was shown by the fact that a number of them decided to join up. Mr. Jones outlined the events which had led to the formation of the Association, and, in doing so, paid tribute to the effective organising work carried on by Mr. C. J. Burchell, to whom, on behalf of the members, he handed a silver cigarette case. Thanks were expressed to Mr. Rees for placing a room at the disposal of the Association for weekly meetings and debates, and to FLIGHT for a cup which it is hoped will be put up for competition during the coming season. After the dinner, an excellent musical programme was gone through, and Mr. Jack Louch proved that he can do as wonderful things with a piano as he can with an aero-model. Those who rendered items were Miss Annie Tester, Miss Ethel Revnell, and Messrs. T. Nicall, H. Pinfold and A. Rippon.

NOTICE TO ADVERTISERS

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